TRICEPS EXTENSION MACHINE

Related Application

This application claims priority from U.S. Provisional Patent Application No. 60/299,677, filed 20 June 2001, entitled "Triceps Curl Machine."

Field of the Invention

The present invention relates generally to exercise machines, and more specifically to exercise machines that exercise the triceps muscles of a user.

Background of the Invention

Exercise devices, and in particular weight training machines, typically include one or more mechanical members that the user repeatedly moves along a prescribed path for exercise. Conventionally, movement of the mechanical member is resisted in some fashion (often by weights) to render the movement more difficult and thereby intensify the exercise. The movement of the mechanical member determines what muscle or muscle groups are to be involved in the exercise.

One popular exercise movement for weight training is the "triceps extension" motion, in which an exerciser bends his arms at the elbow to grasp a handle or other grasping device, and straightens his arms while maintaining the upper arms or elbows in a substantially stationary position. This exercise movement tends to work the triceps muscles of the upper arms.

Some triceps extension machines include a frame that has a base and vertical uprights that rise from the base, a seat that is mounted to the frame, and a pair of movement arms that are pivotally mounted to and extend inwardly from the vertical uprights. Support pads for the user's elbows extend inwardly from the vertical uprights. The user sits on the seat, rests his elbows on the supports, grasps the movement arms with his arms bent, and extends his arms such that the movement arms pivot relative to the frame. This movement is resisted by weights or other resistance system.

In many triceps extension machines of this general configuration, planes defined by each vertical upright are generally parallel with one another. The axes of rotation of the movement arms tend to be substantially normal to these planes. As a result, the movement arms are positioned in front of a seated user. This configuration may be inconvenient for a user as he enters the machine; often the movement arm must be moved out of the way in order for the user to sit.

In addition, typically the user sits so that his elbows are at substantially the same height as his shoulders during exercise. However, in this configuration the user's elbows may tend to become disengaged with the supports they rest upon, which may reduce the effectiveness of the exercise.

Summary of the Invention

The present invention is directed to a triceps extension machine that can enable a user to be seated more easily. The exercise machine includes: a frame configured to rest on an underlying surface; a seat mounted to the frame and configured to receive a seated user; a pair of support pads mounted to the frame forwardly of and above the seat, each of the support pads being positioned to engage one of the upper arms and the elbows of the seated user; a pair of movement arm units pivotally interconnected with the frame and movable about respective generally horizontal axes of rotation; and a resistance system connected with the movement arm units. Each of the pair of movement arm units is configured to engage the forearms and/or the hands of the user and is movable between a retracted position, in which the seated user's arms are bent, and an extended position, in which the user's arms are extended, the axes of rotation forming an angle of between about 115 and 155 degrees. The resistance system provides resistance to rotation of the movement arm units as they move from the retracted position to the extended position. In this configuration, the triceps extension machine may provide easier access to a user than prior triceps extension machines.

The present invention is also directed to a triceps extension exercise machine that can stabilize the elbows of the user during exercise. This aspect of the invention comprises: a frame configured to rest on an underlying surface; a seat mounted to the frame and configured to receive a seated user; a pair of support pads mounted to the frame forwardly of and above the seat, each of the support pads being positioned to engage one of the upper arms and the elbows of the seated user; a pair of

movement arm units pivotally interconnected with the frame and movable about respective generally horizontal axes of rotation, each of the pair of movement arm units being configured to engage the forearms and/or the hands of the user, each of the pair of movement arm units being movable between a retracted position, in which the seated user's arms are bent, and an extended position, in which the user's arms are extended; and a resistance system connected with the movement arm units that provides resistance to rotation of the movement arm units as they move from the retracted position to the extended position. The elevations of the seat and the support pads are selected such that, when the user is seated and the user's upper arms or elbows engage the support pads, the user's upper arms are angled upwardly from shoulder to elbow at an angle of at least 10 degrees. In this configuration, the user's elbows tend to remain engaged with the support pads, thereby improving the effectiveness of the exercise.

As an additional aspect, the present invention is directed to a frame for an exercise machine that can provide easy access to the exerciser. Such a frame comprises: pairs of front and rear uprights rising from respective legs, each set of respective front and rear uprights and legs defining a generally vertical plane, the generally vertical planes defining an angle of between about 20 and 70 degrees; a seat mounted to the frame and configured to receive a seated user; and a pair of pads mounted to the frame forwardly of the seat, each of the pads being positioned to engage the upper arms of the seated user. The frame is adapted to receive a pair of movement arm units pivotally interconnected with the frame and movable about respective generally horizontal axes of rotation, each of the pair of movement arm units being configured to engage a portion of the arms or hands of the user, each of the pair of movement arm units being movable between a retracted position, in which the seated user's arms are bent, and an extended position, in which the user's arms are extended. A frame of this configuration may be used for either a triceps extension machine or a biceps curl machine.

Brief Description of the Figures

Figure 1 is a perspective view of a triceps extension machine of the present invention.

Figure 2 is a side view of the machine of **Figure 1**, with the retracted exercise position being shown in solid line, and the extended position being shown in phantom line.

Figure 3 is an exploded view of the frame, cam assemblies, handle assemblies, and seat assembly employed with the machine of the present invention.

Figure 4 is a perspective view of the weight stack employed with the machine of the present invention.

Figure 5 is a schematic view of the belt-pulley system of the machine of the present invention.

Figure 6 is a partial top view of the frame of the machine of the present invention.

Figure 7 is a partial side view of the frame and seat support member of the machine of the present invention.

Figure 8 is a graph plotting resistance as a function of cam angle for certain embodiments of the present invention.

Detailed Description of the Invention

The present invention will now be described more fully hereinafter, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, like numbers refer to like elements throughout. Thicknesses and dimensions of some components may be exaggerated for clarity.

A triceps extension machine, designated broadly at **10**, is illustrated in **Figures 1-7**. The machine **10** includes a frame **11**, a weight stack **12**, a seat assembly **13**, two movement arm units **40**, and two pulley systems **50**, **60**. These components are described in more detail below.

Referring to **Figures 1-3**, **6** and **7**, the frame **11** includes a base **14** with legs **14a, 14b** and a cross member **14c**, rear uprights **15a, 15b** that extend upwardly and forwardly from rear portions of the legs **14a, 14b**, and front uprights **16a, 16b** that extend upwardly from front portions of the legs **14a, 14b**. The rear and front uprights **15a, 16a** define plane $\mathbf{P_1}$ and the rear and front uprights **15b**, **16b** define a plane $\mathbf{P_2}$.

The planes P_1, P_2 form an angle α (see **Figure 6**) of between about 20 and 70 degrees, with an angle α of between 35 and 45 degrees being preferred, and an angle α of about 40 degrees being most preferred. This angular arrangement can provide easy access into the machine for a user; as noted above, prior machines, particularly those that have frame arms and uprights that are parallel to one another, may require that the movement arm be raised in order for the user to be seated for exercise. A respective pad arm **17a, 17b** extends inwardly and upwardly from each front upright **16a, 16b** to terminate at a position below the horizontal portions of the rear uprights **15a, 15b**. A support pad **18** is attached to the upper end of each pad arm **17a, 17b** in position to engage the upper arms or elbows of the user. A seat mounting platform **33** is mounted to the forward edge of the cross member **14c**.

Those skilled in this art will appreciate that the frame **11** may take alternative forms. For example, additional uprights may be employed, or certain components may be formed from multiple pieces. Further, those skilled in this art will recognize that the frame **11** may be suitable for use as part of a biceps curl machine, such as that described in co-assigned and co-pending U.S. Patent Application Serial No. _____, entitled "Biceps Curl Machine" filed concurrently (Attorney Docket No. 9289-3).

Referring now to **Figures 1, 2** and **4**, the weight stack **12** is positioned on the leg **14b** and includes a plurality of weights **20** arranged in a vertical stack. Two guide rods **21a, 21b** extend vertically from the leg **14b** to the upper portion of the rear upright **15b**; the weights **20** have apertures that receive the guide rods **21a, 21b** such that the weights are free to slide vertically thereon. An elongate lifting member **22** extends through an aperture in the center of each weight **20**. The lifting member **22** includes apertures **23** that can receive a pin **24**. An auxiliary weight stack **25** includes a pair of lighter weights **26** that slide on a guide rod **27** that also extends from the leg **14b** to the upper portion of the rear upright **15b**. An auxiliary weight bracket **28** is attached to the uppermost weight **20** and to a stack pin **28a** that fits within a groove in the guide rod **27** and includes apertures to receive a pin **29** for the selection of weights **26**.

Those skilled in this art will appreciate that other resistance systems may be employed with the present invention. For example, other weight stack configurations, friction-imparting devices, variable viscosity devices, air drag-based resistance devices, and the like, may also be employed with a machine of the present invention.

Exemplary resistance devices include those illustrated in U.S. Patent Nos. 5,810,696; 4,708,338; 4,720,093; 5,033,733; 4,542,897; 4,298,893; 4,805,901; 4,790,528; 4,786,049; 5,031,900; 4,775,145; 4,589,656; and 4,659,074, the disclosures of each of which are hereby incorporated herein by reference in their entireties.

The seat assembly **13** includes a support member **33** that is mounted to the seat mounting platform **19** and extends upwardly and rearwardly therefrom. Preferably, the support member **30** reclines at an angle β (**Figure 7**)with the underlying surface that is between about 60 and 80 degrees, and more preferably between about 70 and 80 degrees, with 75 degrees being most preferred. A track **31** with a serrated front surface **32** is mounted to the front surface of the support member **30**. A seat bracket **33** is mounted to the track **31** such that the rear edge thereof mates with one of the serrations in the track front surface **32**. A seat **34** is mounted on the upper surface of the seat bracket **33**. The interaction between the seat bracket **33** and the serrations in the track front surface **32** enable the seat **34** to be adjusted vertically to a number of discrete positions along the track **31**. A backrest **35** is mounted to a backrest support **36**, which is in turn mounted to the support member **30** above the seat **34**; the reclining angle of the backrest support **36**, and in turn the backrest **35**, can be adjusted as desired.

Each of the movement arm units **40** is pivotally attached to the frame **11**; only one movement arm unit **40** will be described in detail herein, as the movement arm units **40** are essentially mirror images of one another. A cam **41** is pivotally attached to an upper portion of each front upright **16a, 16b** via a pivot pin **41a** that extends through an aperture in a respective front upright **16a, 16b**. The cam **41** has an upper camming surface **41b**. A lever arm **42** extends upwardly and rearwardly from each cam **41** and terminates in a hollow, elongate sleeve bearing hubs **43**. An L-shaped handle **49** includes a grip portion **44** that points generally downwardly and is gripped by the user's hand, a padded bearing surface **47** that is configured to be engaged by the user's hand or forearm, an intermediate portion **45** that merges with the grip portion **44**, and a mounting portion **46** that is received within and pivots relative to the bearing **43**. Thus, each handle **49** is free to pivot relative to its corresponding lever arm **42** about a respective generally horizontal axis of rotation **A1, A2**, and each cam **41** is free to pivot relative to its corresponding upright **16a, 16b** about a respective axis of rotation **B1, B2** that is substantially parallel with its corresponding axis of

rotation **A1, A2**. Notably, the axis **A1** defines an angle γ (**Figure 6**) which is between about 115 and 155 degrees with the axis **A2**, and more preferably is between 135 and 145 degrees, with 140 degrees being most preferred; consequently, the axis **B1** forms a similar angle with the axis **B2**. Also, it is notable that the axes **A1, A2** are substantially perpendicular to the respective planes P_1, P_2 defined by the arms **14a, 14b** and their respective rear and front uprights **15a, 15b, 16a, 16b**.

The configuration of the camming surface **41b** controls the resistance curve experienced by the user during exercise. Fundamentally, it is typically desirable to vary the resistance experienced by the user at different points during movement; otherwise, the magnitude of resistance necessary to provide a strengthening workout to a muscle or muscle group may be too high to enable the user to move the movement arm unit **40** through positions within the full range of motion in which the user enjoys a lower mechanical advantage. In the illustrated embodiment, the non-circular camming surface **41b** of the cam **41** causes the resistance experienced by the user to follow the resistance curve illustrated in **Figure 8**. Those skilled in this art will recognize that, although a non-circular cam is preferred to provide a varying resistance curve to the machine **10**, other structures, such as four-bar linkages and the like, can also be employed to vary the resistance of the machine during exercise.

The movement arm units **40** are interconnected with the weight stack **12** via two pulley systems **50, 60 (Figure 5)**. The pulley system **50** includes a belt **51** that is attached to the forward portion of the perimeter of one cam **41**. The belt **51** follows the contour of the upper camming surface **41b** of the cam **41** as the belt **51** travels rearwardly, then extends downwardly to a pulley **52** mounted to an upper portion of one rear upright **15a,** extends downwardly to a pulley **53** mounted to one end of a floating pulley bracket **54** (seen best in **Figure 3**), extends horizontally to a pulley **55** mounted to the other end of the floating pulley bracket **54**, extends upwardly to a pulley **57** mounted on the opposite rear upright **15b**, and terminates by following the contour of the upper camming surface **41b** of the other cam **41** and attaching to the forward perimeter portion thereof. The pulley system **60** includes a belt **61** that is attached to the lifting member **22** and extends upwardly over a pulley **62** attached to a forward portion of a pulley mounting bracket **63** attached to the upper portion of the frame **11**, rearwardly to a pulley **64** attached to the rear portion of the pulley mounting bracket **63**, downwardly to a pulley **65** attached to a bracket **69** attached to the lower

end of the rear upright **15b**, horizontally to a pulley **66** mounted via a pin **67** to the cross member **14b**, and upwardly to fixedly mount to a pin **68** mounted to the lower central portion of the floating pulley mounting bracket **54**.

Those skilled in this art will recognize that, although the pulley systems **50, 60** are employed to interconnect the weight stack **12** and the movement arm units **40**, other systems that connect the movement arm units and the chosen resistance system, such as cables, chains, and the like, may be suitable for use with the present invention.

In operation, the user selects a desired weight by inserting the pin **24** into an aperture in the individual weight **20** that provides the user with a stack of weights **20** that corresponds to the desired exercise resistance (and, if desired, inserts the pin **29** to select one or both auxiliary weights **26**). The user then adjusts the seat assembly **13** to the desired height (preferably one in which the user's elbows align with the axes of rotation **B1, B2**) by manipulating the seat **34** until the seat bracket **33** mates with a desired serration **31** on the track front surface **32**. The user may also adjust the angle of the backrest **35**. The user then sits upon the seat **34**, rests his back against the backrest **35**, grasps the grip portions **44** of the handles **49**, and places his elbows on the pads **18** with his arms bent at the elbow (see **Figure 2**). In this retracted position, the lever arm **42** extends upwardly and rearwardly from the cam **41**, and the grip portion **44** of the handle **49** extends downwardly and rearwardly from the bearing hub **43**. It is preferred that the user be seated at a height such that the user's upper arms are angled upwardly from shoulder to elbow; an angle of at least 5 degrees is preferred, with an angle of at least 10 degrees being more preferred. This posture tends to stretch the user's latissimus dorsi and the triceps, thereby increasing the range of motion and stabilizing the position of the elbows during the exercise movement, which is intended to work the triceps.

Exercise is performed by the user straightening his arms at the elbows and pressing on the bearing surfaces **47**, thereby driving the grip portions **44** of the handles **49** away from his shoulders to an extended position (see **Figure 2** in phantom line). Doing so causes the cams **41** to pivot relative to the rear uprights **15a, 15b** and take up some of the belt **51** on their camming surfaces **41b** (when viewed from the right side of the user, both cams **41** pivot clockwise). As the cams **41** take up the belt **51**, the shortening of the belt **51** causes the floating pulley bracket **54** to rise, which in turn draws the end of the belt **61** attached to the pin **67** of the floating pulley bracket **54** upwardly. As the end of the belt **61** rises, it draws the selected weights **20** in the

weight stack **12** upwardly, thereby providing resistance to the user. Once the user has straightened his arms, he bends them at the elbow to return the movement arm units **40**, the weights **20**, and the pulley systems **50**, **60** to their original positions.

The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.